Institute for Collaborative Biotechnologies
Informational Meeting
12 February 2003

"SOLDIER AS A SYSTEM"

Technology Priorities

PEO Soldier

Activated 7 June 2002
www.peosoldier.army.mil

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Program Executive Office Soldier

Agenda

- PEO Solider
- Soldier as a System
- Technology Priorities

One Team
Fielding Soldier Products

TRADOC

Needs & Requirements

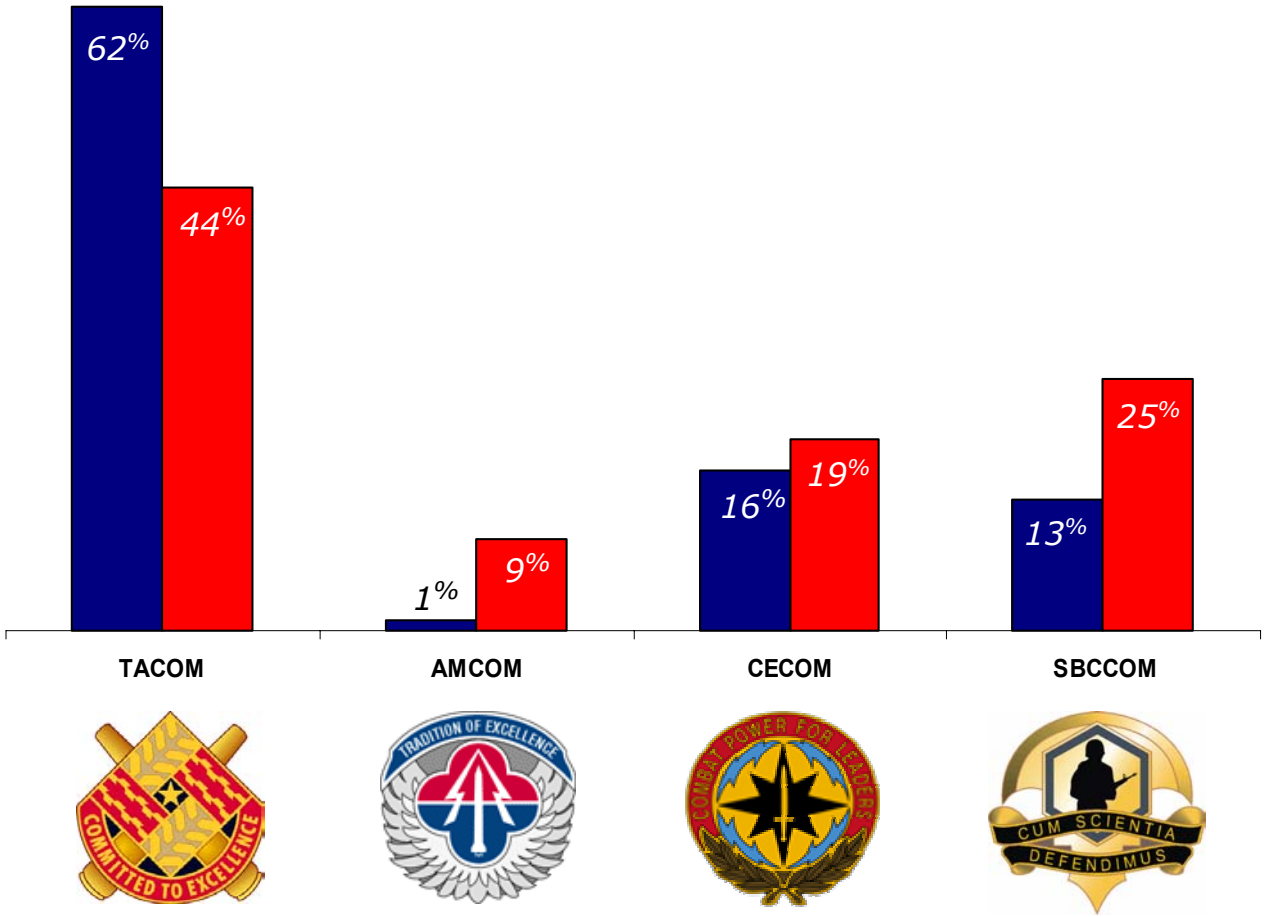
SBCCOM AMC TACOM

AMCOM CECOM

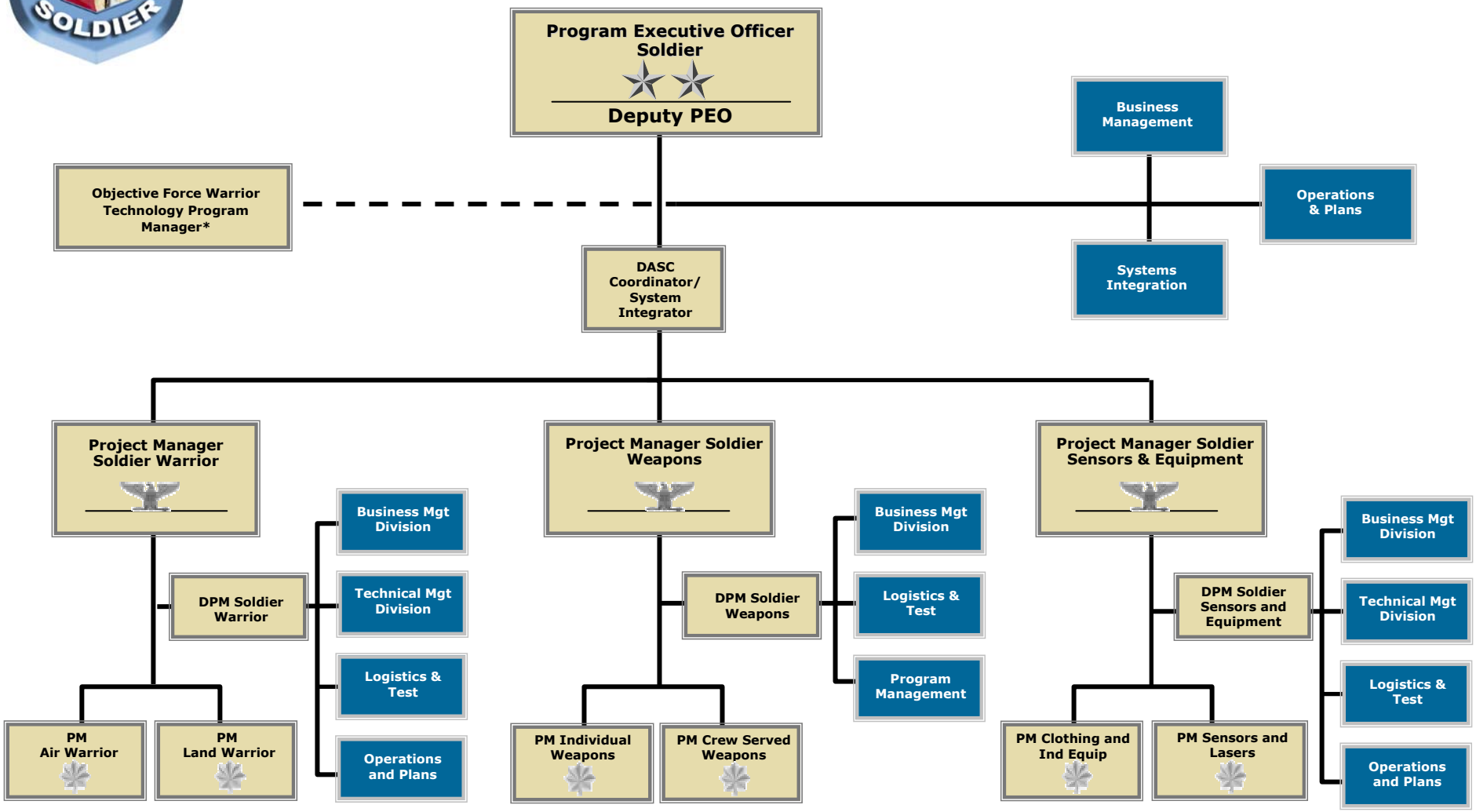
Science & Technology

Gateway to the Soldier

AMC Matrix Support to PEO Soldier



Program Executive Office Soldier

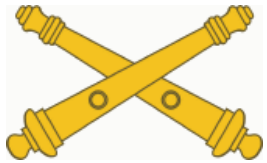


*** Dual Reporting NSC/PEO**

As of: 03 February 2003

PEO Soldier Programs by Branch Proponent

229 Programs



3 Programs

10 Programs

30 Programs

35 Programs

12 Programs

18 Programs

31 Programs

3 Programs

6 Programs

1 Program

2 Programs

Supporting Soldiers Everywhere

Soldier As A System

- Wears
- Carries

Arm and Equip Soldiers to Dominate the Full Spectrum of Peace and War Now and in the Future.

Integrating 346 programs for the Soldier

Soldier as a System Concept

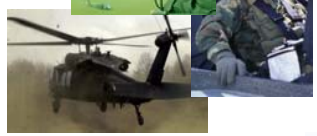
Engineer

Airborne

Infantry

Rangers

Military Police



Aviation

Special Forces

Medic

Field Artillery

Armor

Consolidating Diverse Requirements

Objective Force Soldier
Land Warrior & More

Land Warrior-AC

XM8

XM29

XM307

XM107
... etc

Viper II

MFL

PLTD

Fused I^2/thermal
... etc

Micro UAV

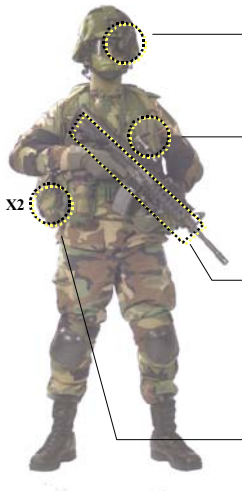
Squad Mule
... etc

Soldier System/ OCIE + ***Soldier Weapons*** + ***Soldier Sensors*** + ***Soldier ASIOE***

Fielding Objective Force Soldier requires alignment *and* funding of *multiple* programs

Land Warrior System Development and Roadmap

Land Warrior System



Helmet Subsystem
- Soldier Color Display / Audio Headset & Microphone
- Provides Soldier a common operational picture

Soldier Control Unit
- Soldier's device to control system & establish tactical identity
- Communications processor
- Single component to manage LW functions

Weapon Subsystem
- Tailored to integrate multiple systems
  - Thermal sights / Multi-functional Laser / Day Video Sight / Alternate user input device
- Soldier is focused on killing enemy

System Power
- One on each side of soldier
- Rechargeable or disposable batteries

Land Warrior System

Communications Subsystem
- Soldier "mesh" intercom antenna / Leader radio / Radio Antenna / power amplification /
- Embedded soldier communication with additional radio for leader longer range communications

Computer Subsystem
- Manages input, processing and output functions
- Stores manuals
- Stores standard map products

Navigation Subsystem
- Provides soldier position and heading on standard map products
- Utilizes dead reckoning module when GPS signal not present
- Soldier knows his location, know his teams location, maneuvers and shoots more effectively

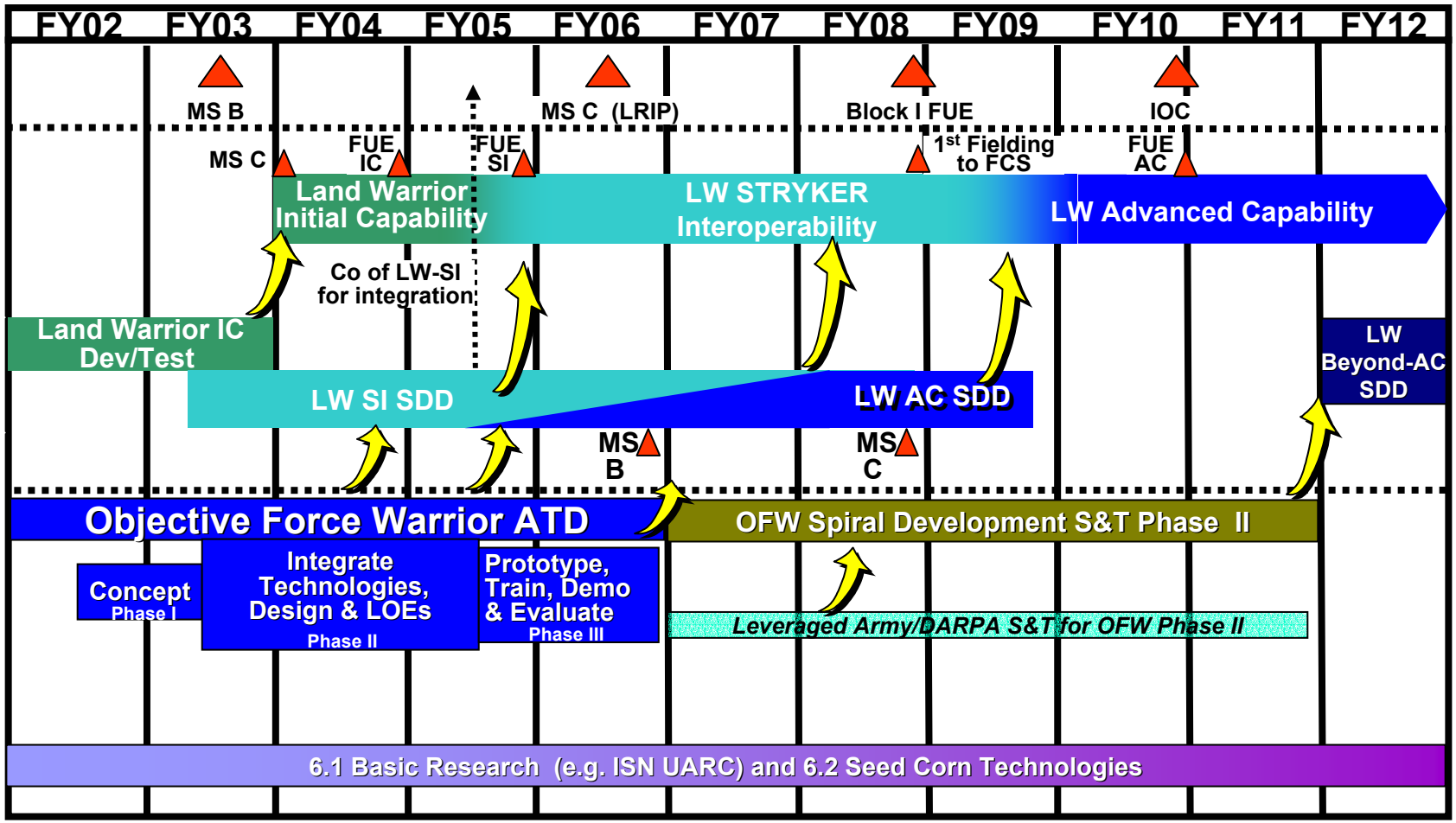
Soldier Equipment
- Integrates soldier equipment improvements such as JSLIST / Interceptor Body Armor

LW Development Philosophy

- Maximize COTS and GOTS
- Evolutionary Acquisition
- Meet the Warfighters' Blocked Requirements in multiple capability increments.
  - *Land Warrior-Initial Capability (LW-IC)* meet the Threshold Block I ORD requirements. Fielding to the 75th Ranger Regiment.
  - *Land Warrior-Stryker Interoperable (LW-SI)* version 1 will use the LW-IC design to meet ORD Block II requirements for Re-Charge on the Move (designed) and Tactical Internet Connectivity.
  - *Land Warrior-Advanced Capabilities (LW-AC)* will leverage Objective Force Warrior technology development to maintain relevance of the fielded fleet and achieve ORD objective requirements.

Land Warrior System Roadmap

Technology Transition



TRL/IRL Relationship

TRL (Technology Focused)		IRL (Platform Focused)	
Actual system "flight proven" in Operation	9	5	Operational System Fab & Operations
Actual Technology Flight Qualified by Demo	8	4	Proto/Demo in Rep Environ.
Proto Demo in Operational Environ.	7	3	Mockup or Proto in Gnd Test Environ.
Model or Proto Demo in Relevant Environ.	6	2	System Design Analysis Completed
Component and/or Breadboard Validation in Rel. Environ.	5	1	Concept Systems Analysis Completed
Component and/or Breadboard Validation in Lab Environ.	4		
Analytical and Exp. Critical Function Proof-of-Concept	3		
Concept and/or Application Formulated	2		
Basic Principles Observed and Reported	1		

From Concept to the Field

Research

ARO
ARL

Labs

SBCCOM
TACOM
CECOM
AMCOM

Materiel Development

PEO SOLDIER

The Soldier

Concepts
6.1 Funding

Prototypes
6.2 – 6.3 Funding

Low Rate Prod
6.4+Funding

Engineering & Manufacturing Readiness Levels

Integration Readiness Levels

Technology Readiness Levels

Readiness

Deliver New Capabilities

Land Warrior Key Performance Parameters (KPPs) – Weight and Power

Block I (Initial Capability) FY04	*Block II (Stryker Interoperable) FY05*	*Block III (draft) (Advanced Capability) FY10/11*
• Mobility – Soldier's combat load no greater than 84 lbs threshold, 77 lbs objective	• Mobility – Soldier's combat load no greater than 77 lbs threshold, 72 lbs objective	• Mobility – Soldier's combat load no greater than 50 lbs threshold, 40 lbs objective
• Sustainment – 12 Mission hours w/disposable power source that weighs no more than 2.0 lbs threshold, 72 mission hours (weight independent) objective	• Sustainment – 24 mission hours w/disposable power source, 72 mission hours objective	

Weight & Power Challenges

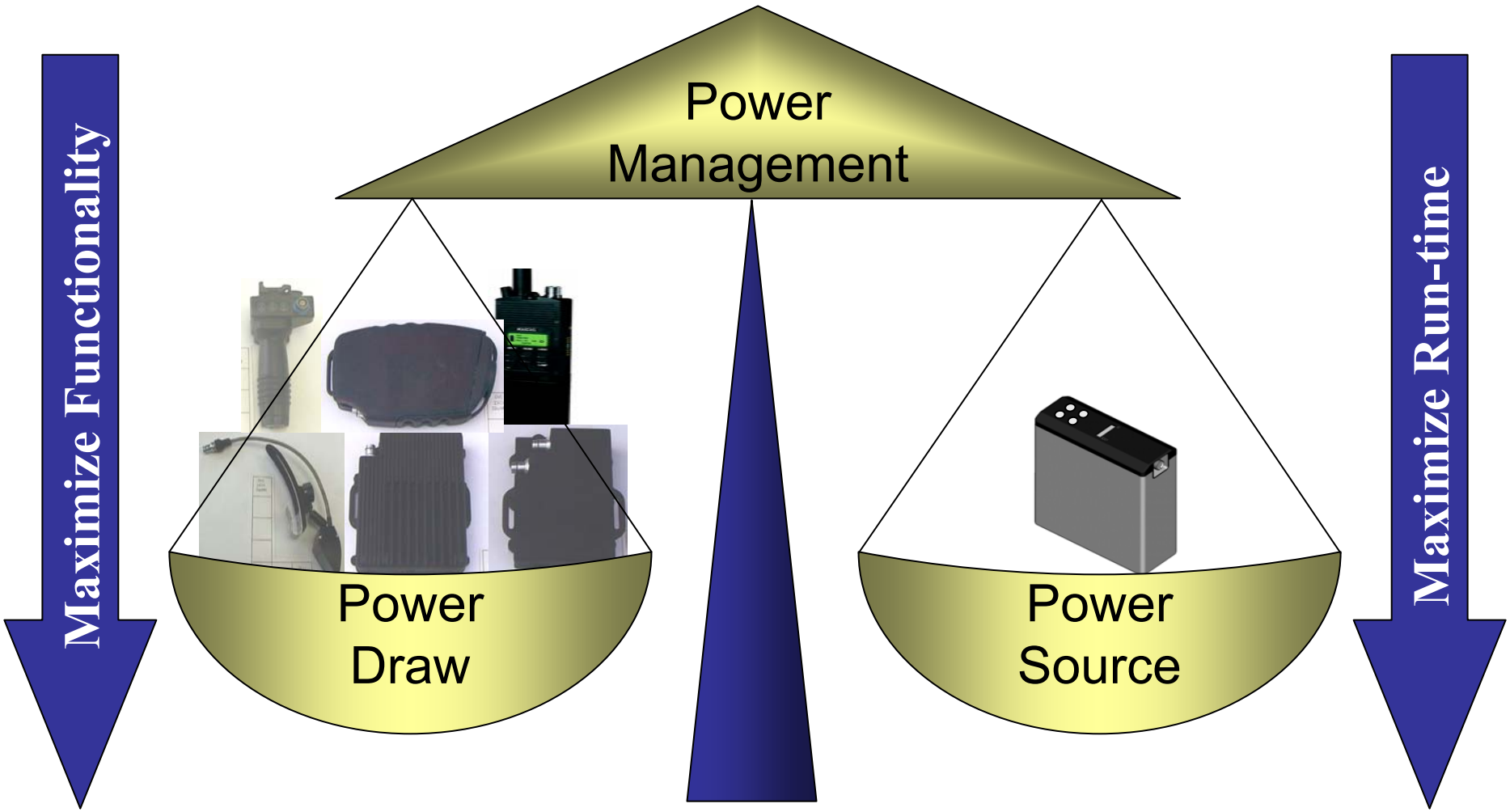
Weight

FIGHTING LOAD:	
BDU's , CBT BOOTS, SOCKS, ELBOW/KNEE PADS	9.5
M4 WEAPON W/ 30 RD MAGAZINE	7.4
THREE 30RD MAGAZINES	3.0
BAYONET W/ SCABBARD	1.8
FRAGMENTATION GRENADE	1.0
BALLISTIC LASER PROTECTION SPECTACLES	0.1
WRISTWATCH	0.3
LIGHT THERMAL WEAPON SIGHT	2.5
AN/PVS14 NIGHT VISION GOGGLES	1.2
XM45 MASK, CARRIER, M256 DECON KIT	3.7
ICH HELMET	3.0
LOAD BEARING EQUIPMENT	3.2
ON THE MOVE HYDRATION SYTEM	4.9
INTERCEPTOR BODY ARMOR W/O PLATES	8.4
AN/PAC -4B/C AIMING LIGHT	0.6
LENSATIC COMPASS	0.4
LW UNIQUE ITEMS	12.75
APPROACH LOAD:	
THREE 30 RD MAGAZINES	3.0
FRAGMENTATION GRENADE	1.0
SMOKE GRENADE	1.2
ENTRENCHING TOOL	2.5
TOILET ARTICLES	1.5
1X MEAL, READY TO EAT	1.5
CAMOUFLAGE PAINT	0.1
CLOSE COMBAT OPTIC	1.4
WEAPONS CLEANING KIT	0.8
MOLLE PATROL PACK	3.4
TOTAL	**80.15LBS.**

Power

Soldier Equipment	Ave. Power
Lightweight Thermal Weapon Sight	0.765
Daylight Video Sight (DVS)	0.338
Multi -function Laser (MFL) including DCA	3.265
Weapon User Interface (WUI)	0.162
Computer Assembly	0.450
Computer Processing Card	1.563
Leader Config .Only) Handheld Combination Flat -Panel Display	0.899
Leader Config .Only) Handheld Keyboard and Cable	0.094
Card Reader	0.505
Communications Processor Card (Strongarm) and Backplane	3.028
WLAN Card	0.251
VoIP Processor	0.251
GPS Card (backup battery)	1.205
Dead Reckoning Module (DRM)	0.250
Microphone/Speaker Assembly (or Chem Version Spkr + connect)	0.304
Helmet -Mount Display (HMD) and Cable	0.521
HIA Module (Includes breakaway connection to Body PAN)	0.667
Wireless LAN Antenna (including power amplifier)	2.535
Laser/Directed Energy Detectors (training halo or ICIDS function)	0.050
PAN Body Hub (with USB OHC)	1.765
PAN Body Hub (with USB OHC)	1.765
TOTAL	18.631

Elements of Soldier Power



Power Source Progression

Initial Capability FY04

Smart Batteries

- Disposables for War

- Rechargeables for Training

Stryker Interoperable FY05

Hybrid Power Source

Rechargeable Smart Battery
+
Zn-Air Battery

and/or

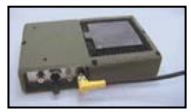
Rechargeable Batteries for Go-to-War Capability

Rechargeable Smart Batteries
+
Integrated Smart Chargers

Advanced Capability FY10/11

Hybrid Power Sources

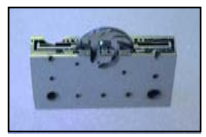
Rechargeable Smart Battery
+
Fuel Cell



- Proton Exchange Membrane
- Direct Methanol
- Solid Oxide

and/or

Rechargeable Smart Battery
+
Power Micro-Electromechanical Systems (MEMS)



- Microturbines

Charging performed:
…at the platoon **…at the squad** **…on the Soldier**

PM Soldier Warrior Technology Priorities

Technology	Date	Description / Benefit
POWER MANAGEMENT		
Zinc-Air Batteries	1QFY04	Increased power & duration
High-Throughput Smart Battery Charger	1QFY04	" "
Power Management SW Initial	1QFY04	Save power, increased duration
Power Management SW Update	4QFY04	" "
Lithium-Air Batteries	4QFY07	Increased power & duration
Fuel Cell for Soldier Application (20W range)	4QFY07	Increased power & duration, reduced weight
Power source with greater than 500 Whr/kg that are wearable by soldiers in combat	FY 05	Increased power & duration, reduced weight
Power source for operating microclimate cooling units (12 Amps @ 128V) for aircrew that is wearable for performing maintenance and checks around vehicles	FY 05	Increased power & duration
Extend Human Endurance	TBD	Enable Soldiers to function extended hours

PM Soldier Warrior Technology Priorities

Technology	Date	Description / Benefit
1024 x 1280 full color see-through displays	FY 05	Situational Awareness
2K x 2K full color see-through displays	FY 09	Situational Awareness
Thinner cold weather gear	FY 05	Reduced weight
Lighter and more flexible body armor that provides protection to a greater number of threats	FY 05	Reduced weight, increased mobility
Accurate positioning (dead reckoning) when GPS is not available that is reliable and can distinguish between floors	FY 05	Secondary positioning
More flame retardant fleece	FY 05	Safety
Chem Bio protection that is less bulky/thinner, reduces heat stress and is flame resistant	FY 05	Reduced stress, weight; safety
Wearable communications and processing hardware/software for handling multiple levels of security	FY 05	Communication Security
Single antenna that can be embedded on a soldier and can handle a greater spectrum (30MHz - 2.5 GHz)	FY 05	Reduced weight, equipment

PM Soldier Sensors and Lasers Technology Priorities

Technology	Date	Description / Benefit
Miniaturized high power designating lasers	FY 06	Increased lethality, reduced weight & power requirements
Miniaturized eye safe low beam divergence range finding lasers	Now	Reduced weight & power requirements
Miniature Non-magnetic direction finding systems - Inertial navigation systems - Miniature gyros - Nano-gyros on a chip	FY 05 or sooner for at least one	Secondary positioning & direction
Integration of multiple direction finding systems for accurate self location	TBD	Secondary positioning & direction
Continue to Improve Low Power Uncooled Focal Plane Arrays (thermal sensors)	NOW!	Situational awareness
Mature New Technology for Low Light Vision Systems	FY 05	Situational awareness
Tiny, High Resolution, Reliable, All-weather Displays	FY 05	Situational awareness
More sensor fusion in the hand-held arena. Multiple wavelengths.	FY 05	Situational awareness
Disposable chem/bio sensors	FY 06	Soldier load

PM Soldier Weapons Technology Priorities

Technology	Date	Description / Benefit
ELECTRONICS/OPTICS	1ST Gen/2nd Gen	
Miniaturization of Electronic Components	2004-5 /2008-10	Reduce Weight and System Envelop
Low Power Drain	2004-5/2008-10	Improve Power Management; Longer Operation
Hi Power-Long Life, Mini Battery	2004-5/2008-10	Longer Operation; Reduced Weight & Logistics
Lightweight, Direct View Optics	2004-5/2008-10	Reduce Weight & Size
High Brightness, Miniature Video Display	2004-5/2008-10	Increase Display Clarity in all light conditions
Embedded Training & Mission Rehearsal	2004-5/2008-10	Inexpensive Training Through Simulation; Train/Rehearse any place/time
Sensor Fusion	2008-10	Increase Sight Clarity & Definition; Easier ID of Targets
Lightweight, Uncooled Thermal Sight	2008-10	Reduce System Size & Weight
Multi-Functional Pointers & Lasers	2008-10	Increased: Accuracy & Hit Probability Reduced: Power Requirements
Shielding From HERO and E3	2008-10	Lightweight; High Protection

PM Soldier Weapons Technology Priorities

Technology	Date	Description / Benefit
FUZING		
Self-Destruct Mechanism (Low Cost)	2004-5 /2008-10	No Duds or Danger to Friendly Forces
Micro Electro-Mechanical Systems (MEMS)	2004-5/2008-10	Low Cost; Increased: Volume for HE
Electronic Fuzing	2008-10	Reduced Fuze Volume, Assembly, Cost; Increased: Lethality
Mini-Setback Power Generator	2008-10	Self-Contained Power Generation Capability
Base Fuzing	2008-10	Full Performance of Shaped Charge Penetration
DIRECTED ENERGY		
Acoustic (Scalable, Non-Lethal to Lethal)	2008-10	Next Generation Weapon System; Complements Current Weapons
Microwave (Scalable, Non-Lethal to Lethal)	2008-10	Next Generation Weapon System; Complements Current Weapons
Laser (Scalable, Non-Lethal to Lethal)	2008-10	Next Generation Weapon System; Complements Current Weapons

PM Soldier Weapons Technology Priorities

Technology	Date	Description / Benefit
ENERGETICS		
Thermobarics	2004-5 /2008-10	Increase Lethality Over Current High Explosives
Insensitive Explosive	2004-5/2008-10	Required to Field New Safer, Munitions
High Velocity, Low Erosion Propellants	2008-10	Increase Performance; Maintains Barrel Life
Nano-Explosives	2004-5/2008-10	Increase Explosive Output & Lethality
Nano-Propellants	2008-10	Increase Launch Energy in Smaller Volume; Reduced: Cartridge Size and Weight
WEIGHT		
Lightweight, High Strength Materials /Composites (Gun Barrels, Mounts, Parts)	2004-5/2008-10	Significantly Reduced: Weapon Weight Increase Barrel Life
Advanced Materials For Cartridge Cases	2004-5/2008-10	Significantly Reduced: Munitions Weight

PM Soldier Weapons Technology Priorities

Technology	Date	Description / Benefit
WARHEAD		
Directional Fragmentation	2008-10	Increased: Lethality; Efficient Use of Fragments
Rocket Assisted	2008-10	Extended Range
Maneuverable Projectile	2008-10	Increased: Accuracy, Probability of Hit
Advanced Shaped Charge Liner Designs/Materials	2008-10	Increased: Lethality in a Given Volume
Advanced Lethal/ Non-Lethal Mechanisms	2008-10	Maintain: Overmatch / Control Without Casualties

Summary

- "Soldier as a System" concept is critical in any technology development for Soldier Systems
- Soldier Systems must be designed for the individual Soldier and the Operational Environment
  - Size, shape, weight, power draw, signature, reliability, open architecture, safety
- PEO Soldier looks for timely technology transition to provide increased capability to the field across the full spectrum